Jaclyn/Joe,

In the July 12 Hydrology/Water Quality Conference Call I agreed to send out a conceptual framework to help the Plennary Group understand the options, in developing a spring rise plan. Attached is a powerpoint presentation that lays out the framework (maybe it is more of a strawman). It is not complete and lacks detail (in part intentionally done because the details should be more of a group product). The current list of plans/options is a moving target and but I tried to capture some of the current suggestions I have heard discussed.

My thought is that we appear to be heading towards many plans, with several groups working independently. A concern is that even if we narrow the number of "Plans" presented to the Plenary Group, each plan will be likely be complex enough that it will be very difficult to deal with. This concept breaks it down into the decision items, the options under each decision item, and the pro/con of those options. Much the same direction as the Corps took in their earlier presentations. In smaller bites, it seems that it is easier to move forward and select from the menu. This approach may also help focus the technical groups and allow us to work more closely as a team.

Hope this is helpful. I throw this out as an idea, not as a final product and would expect heavy edits if we go in this direction. Please feel free to give me a call if you have any questions or want to disucss. I plan to be on the conference call on Monday. thanks jd

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Options

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- **Number/Timing of Rises (one or two)**
- **Magnitude of Rises**
- **Duration of Rises (peak, rising and falling limbs)**
- **Inter-rise period (existing Master Manual or new)**
- **Constraints (flood control targets, flood forecasts, reservoir storage, runoff)**
- **Others**

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Options
Number of Rises

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1. One Rise

    1a. March

    1b. April/May

2. Two Rises

    2a. March and April/May

    2b. March and June/July

Options
Number of Rises

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1a. One Rise - March

- **"Starting point", "experiment to gain information about pallid"**
- **Timing similar to first rise in natural hydrograph**
- **Lacks bimodal feature in natural hydrograph**
- **Less impacts to reservoir spawn than later rise**
- **Less impacts to flooding crops than later rise**
- **Uses less water than bimodal (XX MAF)**
- **Efficient use of water because it coincides with timing of increased releases from winter levels to navigation service**

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Options
Number of Rises

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1b. One Rise - April/May Rise

- **"Starting point", "experiment to gain information about pallid"**
- **Splits timing between peaks in natural hydrograph**
- **Lacks bimodal feature in natural hydrograph**
- **Close to spawning temperature (?15°-18°c?) ...not what was found in "natural" flow/temp. relationship**
- **May negatively impact reservoir spawn (low runoff years)**
- **Increase risk of flood impacts (crops and other)**
- **Uses less water than bimodal (XX MAF)**
- **Not as efficient use of water because not timed for normal start of navigation season**

Options
Number of Rises

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2a. Two Rises - March & April/May Rises

- **"Starting point", "experiment to gain information about pallid"**
- **Bimodal feature in natural hydrograph (second rise mistimed)**
- **Second rise close to spawning temperature (?15°-18°c?) ...not what was found in "natural" flow/temp. relationship**
- **Uses more water than one rise (XX MAF)**
- **April/May rise may negatively impact reservoir spawn in low runoff years**
- **Increase risk of flood impacts (crops and other), especially April/May rise**

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Options
Number of Rises

2b. Two Rises -March & June/July Rises

- **June rise conflicts with tern and plover nesting (could take excessive amount of birds)**
- **"Starting point", "experiment to gain information about pallid"**
- **Bimodal feature timed with "natural" hydrograph; in sync with "natural" flow/temperature relationship**
- **Less impacts to reservoir spawn than April/May rise**
- **Crops may be less susceptible to short duration flooding**
- **Uses more water than one rise**

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Options
Magnitude of Rises

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March Rise

1. Targets + 5 kcfs
2. 8 kcfs (16 percentile of lower one-third runoff years)
3. 11 kcfs (25 percentile of lower one-third runoff years)
4. 22 kcfs (50 percentile of lower one-third runoff years)

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Options
Magnitude of Rises

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April-June Rise

1. Flat release + 5 kcfs
2. Variable up to 16 kcfs (hydological conditions)
3. Variable up to 21 kcfs (hydrological conditions)
4. Fixed at 16 kcfs above pre-rise flow
5. 14 kcfs (25 percentile of lower one-third runoff years)

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Options
Magnitude of Rises

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March Rise

1. **Targets + 5 kcfs**

   - **pro/con**

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Options
Magnitude of Rises

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March Rise

2. 8 kcfs above pre-rise flow (16 percentile of lower one-third runoff years)

- **pro/con**

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Options
Magnitude of Rises

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March Rise

3. 11 kcfs above pre-rise flow (25 percentile of lower one-third runoff years)

- **pro/con**

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Options
Magnitude of Rises

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March Rise

4. 22 kcfs above pre-rise flow (50 percentile of lower one-third runoff years)

- **pro/con**

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Options
Magnitude of Rises

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April-June Rise

1. **Flat Release + 5 kcfs**

   - **pro/con**

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Options
Magnitude of Rises

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April-June Rise

2. Variable up to 16 kcfs above pre-rise flow (hydological conditions)

- **pro/con**

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Options
Magnitude of Rises

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April-June Rise

3. Variable up to 21 kcfs above pre-rise flow (hydrological conditions)

- **pro/con**

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Options
Magnitude of Rises

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April-June Rise

4. Fixed 16 kcfs above pre-rise flow

- pro/con

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Options
Magnitude of Rises

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April-June Rise

5. 14 kcfs above pre-rise flow (25 percentile of lower one-third runoff years)

- **pro/con**

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Options
Duration of Rise
(peak, rising and falling limbs)

March Rise

1. One day peak, rising limb 3kcfs/day, falling limb 1.5 kcfs/day
2. Three day peak, rising and falling limb 3 kcfs/day

April-June Rise

1. One day peak, rising limb 3 kcfs/day, falling limb 1.5 kcfs/day
2. Three day peak, rising and falling limb 3 kcfs/day

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Options
Duration of Rise
(peak, rising and falling limbs)

March Rise

1. **One day peak, rising limb 3kcfs/day, falling limb 1.5 kcfs/day**

   - **pro/con**

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Options
Duration of Rise
(peak, rising and falling limbs)

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March Rise

2. **Three day peak, rising and falling limb 3 kcfs/day**

- **pro/con**

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Options
Duration of Rise
(peak, rising and falling limbs)

April-June Rise

1. **One day peak, rising limb 3 kcfs/day, falling limb 1.5 kcfs/day**

   - **pro/con**

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Options
Duration of Rise
(peak, rising and falling limbs)

April-June Rise

2. **Three day peak, rising and falling limb 3 kcfs/day**

- **pro/con**

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Options
Inter-Rise Period

(between first and second peak)

1. **Service Level Guide Curve in existing Master Manual**

   ≥ 54.5 MAF Full ≤ 49 MAF Minimum

2. **New Service Level Guide Curves**

   ≥ 58 MAF Full ≤ 54.5 MAF Minimum

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Options
Inter-Rise Period

(between first and second peak)

1. Service Level Guide Curve in existing Master Manual

≥ 54.5 MAF Full ≤ 49 MAF Minimum

- **pro/con**

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Options
Inter-Rise Period

(between first and second peak)

2. New Service Level Guide Curves
≥ 58 MAF Full ≤ 54.5 MAF Minimum

- **pro/con**

Options Constraints

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Flood Control

Flood Control Targets (reduced to full service)

1. Current Master Manual (41 kcfs OM, 47 kcfs NC, 71 kcfs KC)
2. New Flood Control Targets (49 kcfs OM, 55 kcfs NC, 75 kcfs KC)
3. Raise Flood Control Targets by amount of rise, during rise period

Options
Constraints

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Flood Control

Flood Targets (reduced to full service)

1. **Current Master Manual (41 kcfs OM, 47 kcfs NC, 71 kcfs KC)**
    - **pro/con**

Options Constraints

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Flood Control

Flood Targets (reduced to full service)

2. **New Flood Control Targets (49 kcfs OM, 55 kcfs NC, 75 kcfs KC)**
   - **pro/con**

Options
Constraints

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Flood Control

Flood Targets (reduced to full service)

3. Raise by amount of rise during rise period

- **pro/con**

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Options Constraints

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Flood Control

Other

1. Stop rise if above flood stage at any location downstream
2. No rise if it will prevent interior drainage for X days (varies with life stage)
3. No rise if flooding is forecasted at any location downstream
4. Increase number of Flood Control Target locations downstream

Options Constraints

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Flood Control

Other

1. **Stop rise if above flood stage at any location downstream**
    - **pro/con**

Options
Constraints

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Flood Control

Other

2. No rise if it will prevent interior drainage for X days (varies with life stage of crops)

- **pro/con**

Options
Constraints

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Flood Control

Other

3. **No rise if flooding is forecasted at any location downstream**

   - **pro/con**

Options Constraints

DRAFT

Flood Control

Other

4. **Increase number of Flood Control Target locations downstream**

   - **pro/con**

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Options Constraints

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Storage

Preclude

1. No 1st or 2nd rise if March 15 System Storage ≤ 31 MAF
2. No March rise if March 15 Storage ≤ 34 MAF and no second rise if March 15 Storage ≤ 41 MAF
3. No 1st or 2nd rise if March 15 System Storage ≤ 50 MAF

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Options
Constraints

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Storage

Preclude

1. **No rise if March 15 System Storage ≤ 31 MAF**
   - **pro/con**

Options
Constraints

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Storage

Preclude

2. **No March rise if March 15 Storage ≤ 34 MAF and no second rise if March 15 Storage ≤ 41 MAF**

   - **pro/con**

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Options
Constraints

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Storage

Preclude

3. No rise if March 15 System Storage ≤ 50 MAF

- pro/con

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Options
Constraints

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Storage

Guide Curve for Second Rise

1. Incrementally decrease from 54.5 MAF full rise, 31 MAF no rise, based on March 15 system storage

2. (others?)

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Options Constraints

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Storage

Guide Curve for Second Rise

1. **Incrementally decrease from 54.5 MAF full rise, 31 MAF no rise, based on March 15 system storage**

    - **pro/con**

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Options
Constraints

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Storage

Other

1. No rise if runoff projection is ≤ lower quartile (19.5 MAF)
2. (others ?)

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Options
Constraints

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Storage

Other

1. No rise if runoff projection is ≤ lower quartile (19.5 MAF)

- **pro/con**

Options
Others

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1. (Others?)